2020

COMPUTER SCIENCE — GENERAL

Paper : DSE-A-2

(Operation Research)

Full Marks : 50

The figures in the margin indicate full marks.

Candidates are required to give their answers in their own words as far as practicable.

Day 2

Answer ***question no.*** **1** and ***any four*** from the rest.

1. Answer ***any five*** questions : 2×5

(a) State duality theorem.

(b) Write the necessary and sufficient condition for existance of a feasible solution to a transportation problem.

(c) What is degeneracy in transportation problem?

(d) Define pure strategy.

(e) Explain in brief about the nature of Operations Research.

(f) Define dual problem.

(g) Give a mathematical formulation of the assignment problem.

(h) What assumptions are made in the theory of games?

2. (a) Solve the following transportation problem to find the minimum transportation cost (using North-West corner rule) :

	To						Available
From	9	12	9	6	9	10	5
	7	3	7	7	5	5	6
	6	5	9	11	3	11	2
	6	8	11	2	2	10	9
Required	4	4	6	2	4	2	

(b) Solve the transportation problem using matrix minima method to minimize the cost. 5+5

	D_1	D_2	D_3	D_4	D_5	Supply
O_1	7	7	10	5	11	45
O_2	4	3	8	6	13	90
O_3	9	8	6	7	5	95
O_4	12	13	10	6	3	75
O_5	5	4	5	6	12	105
Demand	120	80	50	75	85	

3. (a) A firm plans to begin production of three new products. They own three plants and wish to assign one new plant. The unit cost of producing i at plant j is C_{ij}, as given by the folloiwng matrix. Find the assignment that minimizes the total unit cost.

$$\begin{array}{cc} & \text{Plant} \\ \text{Product} & \begin{pmatrix} 10 & 8 & 12 \\ 18 & 6 & 14 \\ 6 & 4 & 2 \end{pmatrix} \end{array}$$

(b) Give a mathematical formulation of the assignment problem. 5+5

4. (a) State the rules for determining a Saddle point.

(b) Solve the following game and determine the value of the game. 5+5

$$\begin{array}{cc} & B \\ A & \begin{bmatrix} 2 & 5 \\ 4 & 1 \end{bmatrix} \end{array}$$

5. (a) Solve the following problem using graphical solution mehtod :

Max $Z = 3x_1 + 4x_2$

subject to the constraints :

$4x_1 + 2x_2 \le 80$

$2x_1 + 5x_2 \le 180$

$x_1, x_2 \ge 0.$

(b) Use the simplex method to solve the following L.P.P.

Maximize $Z = x_1 + 2x_2$

subject to,

$-x_1 + 2x_2 \le 8$

$x_1 + 2x_2 \le 12$

$x_1 - 2x_2 \le 3$

$x_1, x_2 \ge 0.$ 5+5

6. (a) Write the dual to the following linear programming problem. (L.P.P.) :

Maximize $Z = x_1 - x_2 + 3x_2$

subject to the constraints,

$x_1 + x_2 + x_3 \le 10$

$2x_1 - x_3 \le 2$

$2x_1 - 2x_2 + 3x_3 \le 6$

$x_1, x_2, x_3 \ge 0.$

(b) Use duality to solve the followign L.P.P. :

Maximize $Z = 2x_1 + x_2$

Subject to the constraints :

$x_1 + 2x_2 \le 10$

$x_1 + x_2 \le 6$

$x_1 - x_2 \le 2$

$x_1 - 2x_2 \le 1$

$x_1, x_2 \ge 0.$ 5+5

7. (a) Explain how to transform an unbalanced transportation problem into a balanced transportation problem where demand of warehouses is satisfied by the supply of factories.

(b) Solve the following transportation problem.

		Destination			
		1	2	3	Supply
	A	2	3	1	20
Source	B	5	4	8	15
	C	5	6	8	30
Demand		20	30	25	

5+5

8. (a) How will you solve an assignment problem where a particular assignment is prohibited?

(b) How can you maximize an objective function in the assignment problem? 5+5